

AMENDMENTS TO THE CLAIMS

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- 1 1. (Currently allowed) A method of converting an abstract quality of service policy into
2 a new configuration for one or more network devices, the method comprising the
3 computer-implemented steps of:
4 receiving and converting the abstract quality of service policy into a first set of one or
5 more basic commands;
6 receiving one or more first command line interface (CLI) commands that represent a
7 current configuration of a network device;
8 determining a second set of one or more basic commands that correspond to the
9 current configuration of the network device, based on the first CLI commands;
10 transforming the first and second sets of basic commands into one or more second
11 CLI commands which, when executed by the network device, will create a
12 new configuration for the network device that implements the abstract quality
13 of service policy;
14 wherein merging and aggregation is carried out on the first and second sets of basic
15 commands based on state values associated with the basic commands.
- 1 2. (Currently allowed) A method as recited in Claim 1, wherein the step of transforming
2 the first and second sets of basic commands comprises the steps of merging and
3 aggregating the first and second sets of basic commands by eliminating duplicate
4 commands and combining similar commands.
- 1 3. (Currently allowed) A method as recited in Claim 2, wherein the steps of receiving
2 and converting the abstract quality of service policy comprise the steps of:
3 receiving and analyzing one or more abstract policies that are defined by a user using
4 a quality of service management system;
5 creating one or more corresponding instances of basic command objects, to result in
6 creating and storing an initial set of basic commands that represent the abstract
7 policies.

1 4. (Currently allowed) A method as recited in Claim 3, wherein the steps of receiving
2 one or more first command line interface (CLI) commands and determining a second
3 set of one or more basic commands comprise the steps of:
4 receiving the initial set of basic commands;
5 analyzing a current configuration of the network device;
6 determining a third set of one or more CLI commands which, if executed by the
7 network device, would result in creating the current configuration;
8 converting the third set of one or more CLI commands into a set of one or more
9 uploaded basic commands.

1 5. (Currently allowed) A method as recited in Claim 4, wherein the steps of merging
2 and aggregating the first and second sets of basic commands comprises the steps of:
3 receiving the set of uploaded basic commands;
4 comparing the initial set of basic commands to the set of uploaded basic commands;
5 creating and storing a final list of basic commands by determining a minimal set of
6 basic commands which, if executed by the network device, would result in
7 creating a new device configuration that implements the abstract policy.

1 6. (Currently allowed) A method as recited in Claim 5, further comprising the steps of
2 assigning a state value of each basic command in the final list of basic commands
3 upon creation of each basic command.

1 7. (Currently allowed) A method as recited in Claim 6, wherein the step of transforming
2 the first and second sets of basic commands comprises the steps of:
3 receiving the final list of basic commands;
4 based on the state value of each basic command in the final list, translating each basic
5 command in the final list into one or more second CLI commands which,
6 when executed by the network device, will create a new configuration for the
7 network device that implements the abstract quality of service policy.

1 8. (Currently allowed) A method as recited in Claim 1, further comprising the step of
2 assigning a state value of DO to each basic command in the first set upon creation of
3 such basic command, wherein such state value indicates that the associated basic
4 command must be deployed to the network device as part of deploying the new
5 configuration.

1 9. (Currently allowed) A method as recited in Claim 1, further comprising the step of
2 selectively assigning a state value UNDO or EXIST to each basic command in the
3 second set of basic commands, wherein a state value of UNDO indicates that the
4 associated basic command should be removed from the network device as part of
5 deploying the new configuration, and wherein a state value of EXIST indicates that
6 the associated basic command is currently configured on the network device and may
7 be removed or retained as part of deploying the new configuration.

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1 10. (Currently allowed) A method as recited in Claim 8, wherein the steps of merging
2 and aggregating the first and second sets of basic commands comprises the steps of:
3 based on the state value of each basic command in the final list, translating each basic
4 command in the final list into one or more second CLI commands which,
5 when executed by the network device, will create a new configuration for the
6 network device that implements the abstract quality of service policy;
7 when two of the basic commands in the final list are equivalent without considering
8 their associated state values, and when one of the two commands has a state
9 value of DO and the second of the two commands has a state value of UNDO,
10 merging the two commands into one new command having a state value of
11 EXIST.

1 11. (Currently allowed) A computer-readable medium carrying one or more sequences of
2 instructions for converting an abstract quality of service policy into a new
3 configuration for one or more network devices, which instructions, when executed by
4 one or more processors, cause the one or more processors to carry out the steps of:

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5 receiving the abstract quality of service policy;
6 converting the abstract quality of service policy into a first set of one or more basic
7 commands;
8 receiving one or more first command line interface (CLI) commands that represent a
9 current configuration of a network device;
10 determining a second set of one or more basic commands that correspond to the
11 current configuration of the network device, based on the first CLI commands;
12 transforming the first and second sets of basic commands into one or more second
13 CLI commands which, when executed by the network device, will create a
14 new configuration for the network device that implements the abstract quality
15 of service policy;
16 wherein merging and aggregation is carried out on the first and second sets of basic
17 commands based on state values associated with the basic commands.

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1 12. (Currently allowed) An apparatus for converting an abstract quality of service policy
2 into a new configuration for one or more network devices, comprising:
3 a quality of service management system that is coupled to a managed network
4 comprising the one or more network devices and including means for creating
5 and storing an abstract policy defining a quality of service for use by the
6 network devices in carrying one or more network traffic flows;
7 means for converting the abstract quality of service policy into a first set of one or
8 more basic commands;
9 means for receiving one or more first command line interface (CLI) commands that
10 represent a current configuration of a network device;
11 means for determining a second set of one or more basic commands that correspond
12 to the current configuration of the network device, based on the first CLI
13 commands; and
14 means for transforming the first and second sets of basic commands into one or more
15 second CLI commands which, when executed by the network device, will
16 create a new configuration for the network device that implements the abstract
17 quality of service policy;

18 wherein merging and aggregation is carried out on the first and second sets of basic
19 commands based on state values associated with the basic commands.

1 13. (Currently allowed) An apparatus for converting an abstract quality of service policy
2 into a new configuration for one or more network devices, comprising:
3 a quality of service management system that is coupled to a managed network
4 comprising the one or more network devices and including means for creating
5 and storing an abstract policy defining a quality of service for use by the
6 network devices in carrying one or more network traffic flows;
7 basic command processing logic coupled to the quality of service management system
8 and comprising one or more sequences of instructions which, when executed by
9 one or more processors, causes the one or more processors to execute the steps
10 of:
11 converting the abstract quality of service policy into a first set of one or more
12 basic commands;
13 receiving one or more first command line interface (CLI) commands that
14 represent a current configuration of a network device;
15 determining a second set of one or more basic commands that correspond to the
16 current configuration of the network device, based on the first CLI
17 commands; and
18 transforming the first and second sets of basic commands into one or more
19 second CLI commands which, when executed by the network device,
20 will create a new configuration for the network device that implements
21 the abstract quality of service policy;
22 wherein merging and aggregation is carried out on the first and second sets of
23 basic commands based on state values associated with the basic
24 commands.

1 14. (Currently allowed) A method as recited in Claim 1, wherein each basic command
2 expresses control for a network device at an intermediate level of abstraction that is
3 lower than the abstract policy and higher than the CLI commands.

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1 15. (Currently allowed) In a quality of service policy management system that controls
2 deployment of quality of service policies to a plurality of routers in a managed
3 network, a method of converting an abstract quality of service policy into a new
4 configuration for one or more of the routers, the method comprising the computer-
5 implemented steps of:
6 receiving the abstract quality of service from the quality of service policy
7 management system;
8 converting the abstract quality of service policy into an initial set of one or more basic
9 commands;
10 receiving one or more first router command line interface (CLI) commands that
11 represent a current configuration of one of the routers;
12 determining a set of one or more uploaded basic commands that correspond to the
13 current configuration of the router, based on the first CLI commands;
14 creating and storing a final set of basic commands based on the initial set of basic
15 commands and the uploaded basic commands;
16 transforming the final set of basic commands into one or more second CLI commands
17 which, when executed by the router, will create a new configuration for the
18 router that causes the router to implement the abstract quality of service
19 policy;
20 wherein merging and aggregation is carried out on the first and second sets of basic
21 commands based on state values associated with the basic commands.

1 16. (Currently allowed) A method as recited in Claim 15, wherein the step of
2 transforming the final set of basic commands comprises the steps of merging and
3 aggregating the initial set and uploaded basic commands by eliminating duplicate
4 commands and combining similar commands.

1 17. (Currently allowed) A method as recited in Claim 15, wherein the steps of
2 determining a set of one or more uploaded basic commands comprise the steps of:
3 receiving the initial set of basic commands;

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4 analyzing a current configuration of the network device;
5 determining an interim set of one or more CLI commands which, if executed by the
6 network device, would result in creating the current configuration;
7 converting the interim set of one or more CLI commands into a set of one or more
8 uploaded basic commands.

1 18. (Currently allowed) A method as recited in Claim 16, wherein the steps of merging
2 and aggregating the initial first and second sets of basic commands comprises the
3 steps of:
4 receiving the set of uploaded basic commands;
5 comparing the initial set of basic commands to the set of uploaded basic commands;
6 creating and storing a final list of basic commands by determining a minimal set of
7 basic commands which, if executed by the network device, would result in
8 creating a new device configuration that implements the abstract policy.

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1 19. (Currently allowed) A method as recited in Claim 15, further comprising the steps of
2 assigning a state value of each basic command in the final list of basic commands
3 upon creation of each basic command.

1 20. (Currently allowed) A method as recited in Claim 15, further comprising the step of
2 assigning a state value of DO to each basic command in the initial set upon creation of
3 such basic command, wherein such state value indicates that the associated basic
4 command must be deployed to the network device as part of deploying the new
5 configuration.

1 21. (Currently allowed) A method as recited in Claim 15, further comprising the step of
2 selectively assigning a state value UNDO or EXIST to each basic command in the set
3 of uploaded basic commands, wherein a state value of UNDO indicates that the
4 associated basic command should be removed from the network device as part of
5 deploying the new configuration, and wherein a state value of EXIST indicates that

6 the associated basic command is currently configured on the network device and may
7 be removed or retained as part of deploying the new configuration.

1 22. (Currently allowed) A method as recited in Claim 21, wherein the steps of merging
2 and aggregating the initial and uploaded sets of basic commands comprises the steps
3 of:
4 based on the state value of each basic command in the final list, translating each basic
5 command in the final list into one or more second CLI commands which,
6 when executed by the network device, will create a new configuration for the
7 network device that implements the abstract quality of service policy;
8 when two of the basic commands in the final list are equivalent without considering
9 their associated state values, and when one of the two commands has a state
10 value of DO and the second of the two commands has a state value of UNDO,
11 merging the two commands into one new command having a state value of
12 EXIST.

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1 23. (New) A method of converting a quality of service policy into a configuration for one
2 or more network devices, the method comprising the computer-implemented steps of:
3 receiving and converting the quality of service policy into a first set of commands;
4 receiving a current configuration of a network device;
5 determining a second set of one or more commands that correspond to the current
6 configuration of the network device, based on the received current
7 configuration;
8 transforming the first and second sets of commands into a third set of commands
9 which, when executed by the network device, will create a new configuration
10 for the network device that implements the abstract quality of service policy.

1 24. (New) A method as recited in Claim 23, wherein the step of transforming the first and
2 second sets of commands comprises the steps of merging and aggregating the first and

3 second sets of commands by eliminating duplicate commands and combining similar
4 commands.

1 25. (New) A method as recited in Claim 24, wherein the steps of receiving and
2 converting the abstract quality of service policy comprise the steps of:
3 receiving and analyzing one or more abstract policies that are defined by a user using
4 a quality of service management system;
5 creating one or more corresponding instances of command objects, to result in
6 creating and storing an initial set of commands that represent the abstract
7 policies.

1 26. (New) A method as recited in Claim 25, wherein the steps of receiving a current
2 configuration of the network device and determining a second set of commands
3 comprise the steps of:
4 receiving the initial set of commands;
5 analyzing a current configuration of the network device;
6 determining a third set of commands which, if executed by the network device, would
7 result in creating the current configuration;
8 converting the third set of commands into a set of one or more uploaded commands.

1 27. (New) A method as recited in Claim 26, wherein the steps of merging and
2 aggregating the first and second sets of commands comprises the steps of:
3 receiving the set of uploaded commands;
4 comparing the initial set of commands to the set of uploaded commands;
5 creating and storing a final list of commands by determining a minimal set of
6 commands which, if executed by the network device, would result in creating
7 a new device configuration that implements the abstract policy.

1 28. (New) A method as recited in Claim 27, further comprising the steps of assigning a
2 state value of each command in the final list of commands upon creation of each
3 command.

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1 29. (New) A method as recited in Claim 28, wherein the step of transforming the first and
2 second sets of commands comprises the steps of:
3 receiving the final list of commands;
4 based on the state value of each command in the final list, translating each command
5 in the final list into a third set of commands which, when executed by the
6 network device, will create a new configuration for the network device that
7 implements the abstract quality of service policy. -

1 30. (New) A method as recited in Claim 23, further comprising the step of assigning a
2 state value of DO to each command in the first set upon creation of such command,
3 wherein the state value of "DO" indicates that the associated command must be
4 deployed to the network device as part of deploying the new configuration.

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1 31. (New) A method as recited in Claim 23, further comprising the step of selectively
2 assigning a state value UNDO or EXIST to each command in the second set of
3 commands, wherein the state value of UNDO indicates that the associated command
4 should be removed from the network device as part of deploying the new
5 configuration, and wherein the state value of EXIST indicates that the associated
6 command is currently configured on the network device and may be removed or
7 retained as part of deploying the new configuration.

1 32. (New) A method as recited in Claim 30, wherein the steps of merging and
2 aggregating the first and second sets of commands comprises the steps of:
3 based on the state value of each command in the final list, translating each command
4 in the final list into a third set of commands which, when executed by the
5 network device, will create a new configuration for the network device that
6 implements the abstract quality of service policy;
7 when two of the commands in the final list are equivalent without considering their
8 associated state values, and when one of the two commands has a state value
9 of DO and the second of the two commands has a state value of UNDO,

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10 merging the two commands into one new command having a state value of
11 EXIST.

1 33. (New) A computer-readable medium carrying one or more sequences of instructions
2 for converting an abstract quality of service policy into a new configuration for one or
3 more network devices, which instructions, when executed by one or more processors,
4 cause the one or more processors to carry out the steps of:
5 receiving the abstract quality of service policy;
6 converting the abstract quality of service policy into a first set of one or more
7 commands;
8 receiving a current configuration of a network device;
9 determining a second set of one or more commands that correspond to the current
10 configuration of the network device, based on the received configuration;
11 transforming the first and second sets of commands into a third set of commands
12 which, when executed by the network device, will create a new configuration
13 for the network device that implements the abstract quality of service policy.

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1 34. (New) An apparatus for converting an abstract quality of service policy into a new
2 configuration for one or more network devices, comprising:
3 a quality of service management system that is coupled to a managed network
4 comprising the one or more network devices and including means for creating
5 and storing a quality of service policy for use by the network devices in
6 carrying one or more network traffic flows;
7 means for converting the quality of service policy into a first set of one or more
8 commands;
9 means for receiving a current configuration of a network device;
10 means for determining a second set of one or more commands that correspond to the
11 current configuration of the network device, based on the first commands; and
12 means for transforming the first and second sets of commands into a third set of
13 commands which, when executed by the network device, will create a new

14 configuration for the network device that implements the quality of service
15 policy.

1 35. (New) An apparatus for converting a quality of service policy into a new configuration
2 for one or more network devices, comprising:
3 a quality of service management system that is coupled to a managed network
4 comprising the one or more network devices and including means for creating
5 and storing a quality of service policy for use by the network devices in carrying
6 one or more network traffic flows;
7 command processing logic coupled to the quality of service management system and
8 comprising one or more sequences of instructions which, when executed by one
9 or more processors, causes the one or more processors to execute the steps of:
10 converting the quality of service policy into a first set of one or more
11 commands;
12 receiving a current configuration of a network device;
13 determining a second set of one or more commands that correspond to the
14 current configuration of the network device, based on the received
15 configuration; and
16 transforming the first and second sets of commands into a third set of commands
17 which, when executed by the network device, will create a new
18 configuration for the network device that implements the abstract quality
19 of service policy.

1 36. (New) A method as recited in Claim 23, wherein each command expresses control for
2 a network device at an intermediate level of abstraction that is lower than the policy
3 and higher than the received configuration.
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